

Where Did the Water Come From?

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The Earth is distinguished among the terrestrial planets as being the water world. The equivalent of between 2 and 5 times the mass of our ocean is contained in water in the mantle and crust of the planet, and much more may have been present during formation. How the Earth acquired its water is tied intimately to the mechanisms of terrestrial planet accretion and, therefore, has implications for what to expect when we look at the habitable zones of nearby stars. The model that is most consistent with our knowledge of the conditions in protoplanetary disks, the dynamics of terrestrial planet formation, and isotopic constraints, is one in which Earth's water was acquired by collision with large (lunar-to-Mars-sized) bodies formed in what is now the asteroid belt. The primary implication of such a model for extrasolar planetary systems is stochasticity: we should expect a range of terrestrial planet types from dry-like-Mars to water-worlds that would have made Costner^a proud.

[a] Kevin Costner starred in and directed the 1995 movie *Waterworld*, which featured a future Earth covered by water, in which dry land was only a myth.

